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Short communication

Annesorhiza asparagoides (Apiaceae), a new species from the Cederberg Mountains, Western Cape Province, South Africa

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Abstract

A highly localised new species from the Cederberg Mountains near Wuppertal in the Western Cape Province is described. *Annesorhiza asparagoides* B.-E. Van Wyk, collected for the first time in 2009, differs from all other species of *Annesorhiza* (and the closely related *Chamarea*) in the unusual leaf structure, with crowded, subsessile, acicular leaf segments, resulting in dense, bottlebrush-like pinnae. The new species has a cluster of 10 or more slender roots, small (<150 mm long), sparsely hairy leaves and small (±8 mm long), oblong, conspicuously ribbed, homomericarpic fruits.
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Keywords: *Annesorhiza*; Apiaceae; Apioideae; New species; South Africa; Taxonomy

1. Introduction

The genus *Annesorrhiza* Cham. & Schlechtd. is a poorly known group of ±15 or more perennial geophytes endemic to South Africa. The majority of the species occur in the winter rainfall region of the Western and Northern Cape Provinces and are summer-deciduous. They have adapted to a highly seasonal rainfall regime by separating their vegetative and reproductive growth phases. Leaves appear with the first rains in autumn (April to May) and wither during the hot summer months (December to January), after which time the inflorescences usually emerge. Several field visits are often required to collect complete material. As a result, *Annesorhiza* and the closely related *Chamarea* Eckl. & Zeyh. have remained incompletely known despite a synopsis by Burtt (1991) and taxonomic revisions by Tilney and Van Wyk (2001) and Vessio (2001). The study by Vessio (2001) indicated that the generic concept of *Annesorhiza* should be re-evaluated, as the traditional diagnostic characters (fruit shape and size) may no longer reliably distinguish it from *Chamarea*. The larger habit of *Annesorrhiza* species has been traditionally used to distinguish the two genera but the recently described *A. calcicola* (Magee and Manning, 2010) confirmed that size alone (habit and fruit) has limited diagnostic value at the generic level.

Molecular systematic studies combined with field work are currently underway to gain a better understanding of circumscriptions and phylogenetic relationships of *Annesorhiza* and related genera. Magee et al. (2010) have proposed a new tribal classification system for the early-diverging lineages of the family (the so-called "protoapioids"). The genera *Annesorhiza*, *Chamarea* and *Itasina* Raf. are closely related and undoubtedly form a monophyletic group. This clade, together with the South African *Ezosciadium* B.L.Burtt, the North African *Astydamia* DC. and the European *Molopospermum* W.J.D. Koch., was found to comprise a single early-diverging lineage, described as the new tribe Annesorhizeae (Magee et al., 2010). We here describe a distinct new species collected, by ourselves, for the first time in 2009.

2. Species treatment

Annesorhiza asparagoides B.-E. Van Wyk sp. nov., differt a A. fibrosa segmentis folioli acicularibus, teretibus, subsessilibus, dense creberis (in A. fibrosa segmenta folioli plana, acuminata, petiolulata et effusa). TYPE—South Africa, Western Cape

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Province, 3219 (Wuppertal), Koudeberg Pass (–AC), 4 October 2009 (plant and leaves; dried leaves, inflorescences and a few fruits added on 1 February 2010), *Van Wyk, Hulley and Tilney 4452* (NBG, holo.; PRE, iso.).

Small, acaulescent, perennial, deciduous, clump-forming herb with one or more rosettes of leaves (Fig. 1A, B) and slender, leafless inflorescences, up to 0.3 m high. Roots numerous (at least 10), slightly fleshy. Rhizome short, covered with a thick, fibrous mass of leaf remains (Fig. 1A). Leaves in a basal rosette, shrivelled or absent at flowering, 3 to 4-pinnate but appearing 1-pinnate because of the densely crowded, subsessile leaflet segments, resulting in bottlebrush-like, seemingly simple pinnae, small, 100–150 mm long, petioles up to 30 mm long, sheathing at base, very sparsely hairy; pinnae subsessile, 2–3-pinnulate, ultimate leaflet segments densely crowded, small, acicular, terete, ±2 × 0.2 mm (Figs. 1A–E, 2). Inflorescence scape ±0.3 m long, single or branched, with up to 7 umbels per scape, main umbel with ±3 rays. Involucral bracts small, lanceolate, 2–3 mm long, persistent. Involucel of small, lanceolate bracteoles with acute apices. Calyx lobes narrowly triangular, 0.3 mm long. Petals yellow. Stylopodium short, conical. Styles short, erect, reflexed in fruit. Fruit oblong, prominently ribbed (but not winged), 7–8 mm × 3.0–3.5 mm (in lateral view, Fig. 1F), mericarps homomorphic, slightly compressed dorsally (Fig. 3A1, A2); ribs 5, prominent, with large vascular bundles, marginal ribs slightly larger than lateral and dorsal ones; mesocarp thin, with numerous druse crystals below epidermis (Fig. 3A3); vittae 6, 4 in valleculae and 2 in commisure; commissure very narrow; seed with endosperm shallowly to deeply sulcate (ruminate?), concave on commissural side (Fig. 3A1, A2, A4); carpophore present, free for almost entire length of fruit.

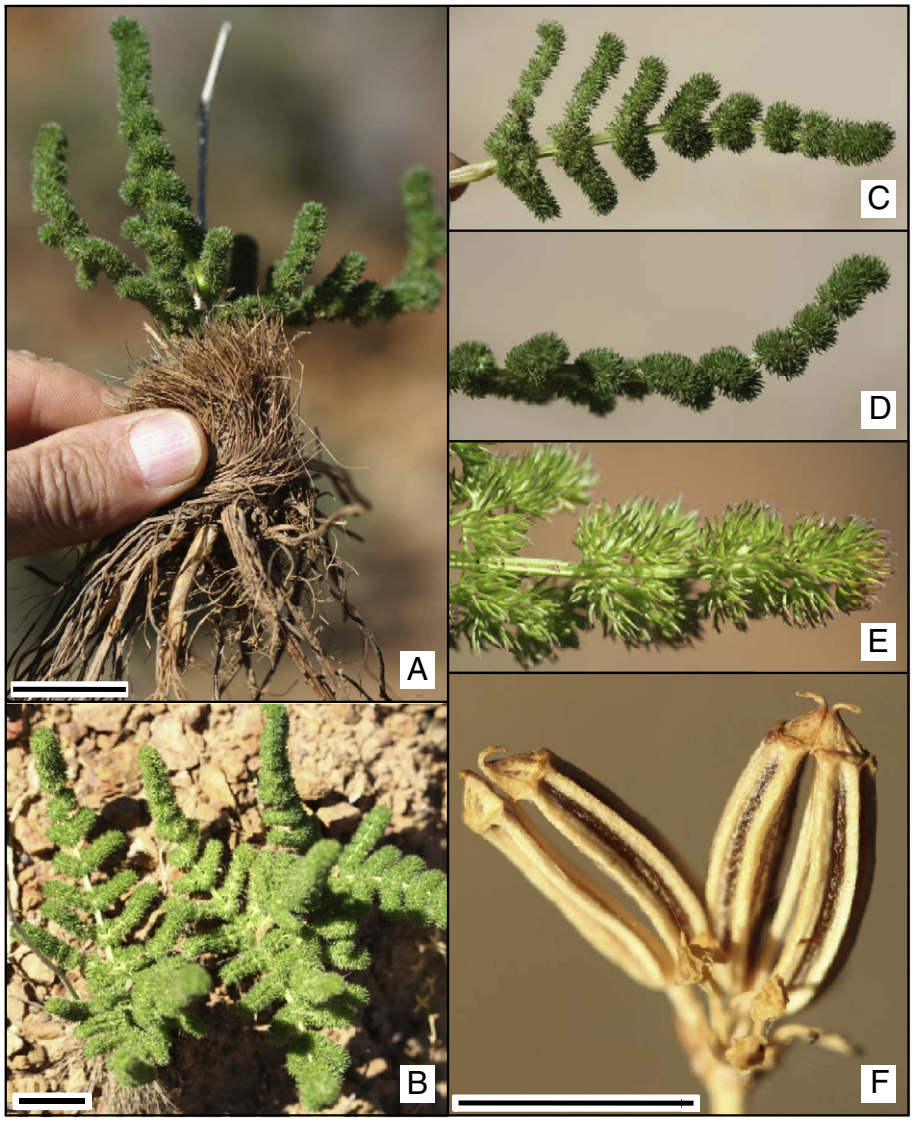

Fig. 1. Morphology of *Annesorhiza asparagoides*. (A) mature plant, showing the fibrous base, numerous roots and distinctive leaves; (B) mature plant with two rosettes of leaves; (C) leaf in top view, showing the densely crowded pinnules and leaflet segments; (D) leaf in side view; (E) close-up of the sessile, crowded leaflet segments; (F) mature fruits (note the prominent ribs). Photographs by B.-E. Van Wyk. Scale bars: (A, B) = 20 mm, (F) = 5 mm.

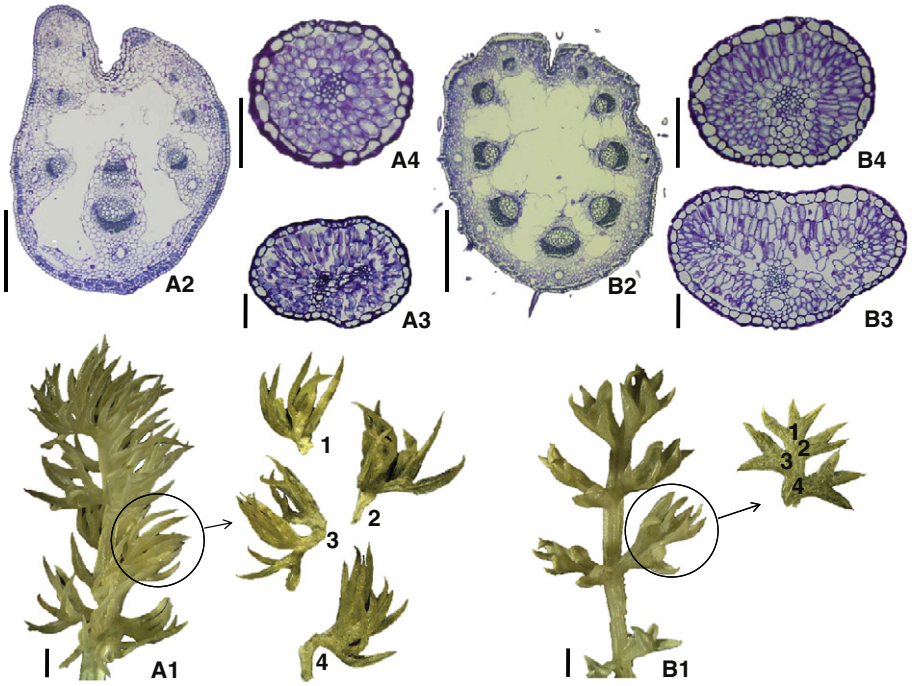

Fig. 2. Leaf structure and anatomy of *Annesorhiza aspargoides* compared with that of A. *fibrosa* (voucher specimen *Van Wyk 3597*, JRAU). (A1, B1) leaf structure, showing a comparison of the shape and number of fourth order pinnae on the pinnules (numbered 1 to 4); (A2, B2) transverse sections through the petiole, showing the presence of a medullary vascular bundle in *A. asparagoides* (note the fibrous vascular bundles and the presence of numerous hairs in *A. fibrosa*); (A3, B3) transverse sections through the laminas of ultimate leaflet segments; (A4, B4) transverse sections through the tips of ultimate leaflet segments (note the oil duct and interruption of the palisade in B4). Scale bars: (A1, B1)=1 mm; (A2, B2)=0.4 mm; (A3, A4, B3, B4)=0.1 mm.

3. Diagnostic characters and relationships

The small habit and very distinct appearance of the new species is shown in Fig. 1. *Annesorhiza asparagoides* is similar to *A. fibrosa* in the numerous, only partly fleshy roots, the fibrous mass of leaf remains around the base of the plant, and the hairy, finely dissected leaves. It differs in the subsessile, densely crowded ultimate leaflet segments that are acicular

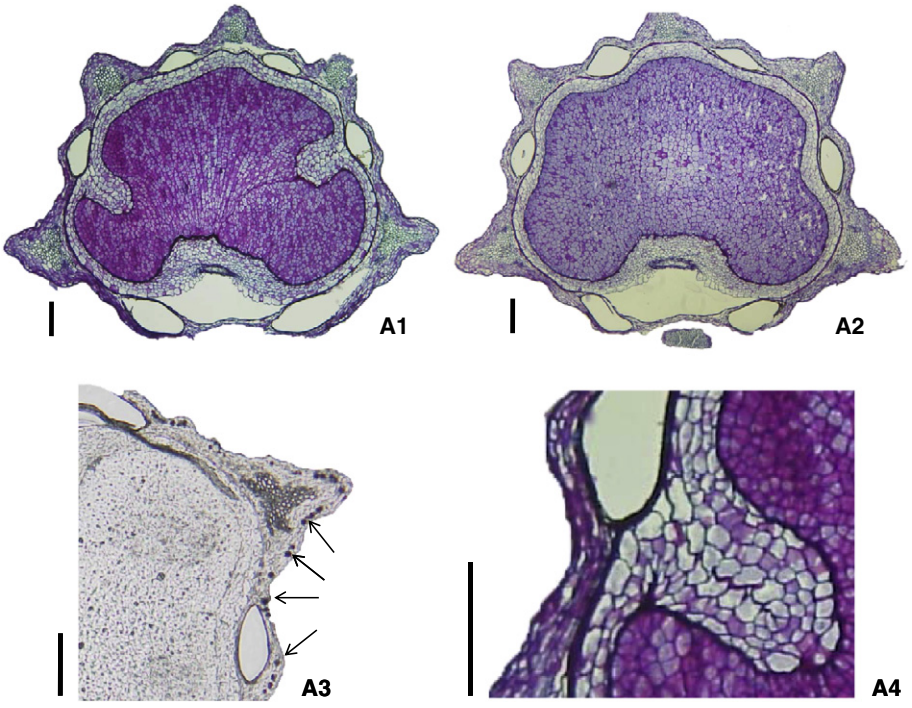

Fig. 3. Fruit anatomy of *Annesorhiza asparagoides.* (A1, A2) mericarps from two different plants, showing the deeply sulcate endosperm found in one of the two mericarps sectioned (A1); (A3) unstained section showing the presence of numerous druse crystals; (A4) detail of A1, showing the sulcate endosperm. Scale bars=0.1 mm.

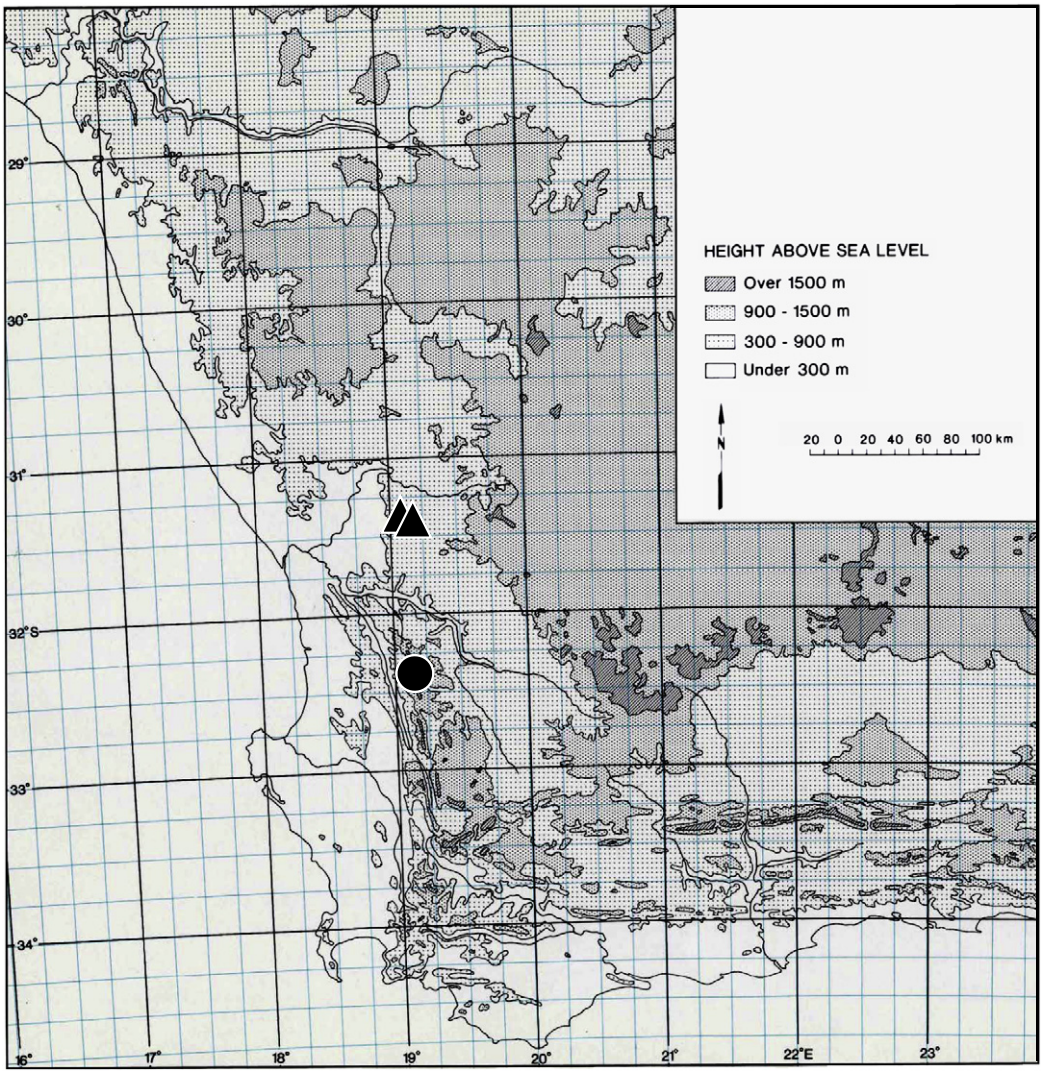

Fig. 4. The known geographical distributions of *Annesorhiza asparagoides* (circle) and *A. fibrosa* (triangles).

(terete in transverse section) at least for a short distance along the tips and only sparsely hairy. As a result the pinnae have a very distinct bottlebrush-like appearance. The difference in leaf structure between the species is shown in Fig. 2. The fibrous leaf remains result from the strongly lignified vascular bundles of the petioles and rachises and subepidermal sclerenchyma (Fig. 2). The new species has a single medullary vascular bundle directly opposite the central abaxial bundle in the petiole (Fig. 2A2). Medullary bundles have not previously been observed in *Annesorhiza* species (Tilney and Van Wyk, 2001) and are not present in *A. fibrosa* (Fig. 2B2). The ultimate leaflet segments are acicular and terete (Fig. 2A3, A4) while those of the related *A. fibrosa* are acuminate and terete only at the tips. There is a greater differentiation towards the tips in *A. fibrosa*, with well-developed palisade parenchyma and an oil duct close to the tip (Fig. 2B3, B4).

One of the two mericarps of *A. asparagoides* that were sectioned showed very pronounced folds into the seed (Fig. 3A1). A ruminate endosperm is known in the Araliaceae but is very rare in Apiaceae, thus far only reported by Burtt (1989) in *Polemanniopsis marlothii* H.Wolff and by Van Wyk et al. (2010) in *P. namibensis* B.-E. van Wyk et al. Preliminary observations of fruit sections of several *Annesorhiza* and *Chamarea* species showed the sporadic presence of multiple cell layers around the endosperm (Fig. 3A4). This interesting observation needs to be investigated once more fruits become available. In common with all other genera and species of the tribe Annesorhizeae, the mericarps of the new species have numerous druse crystals in the mesocarp (Fig. 3A3).

4. Distribution and habitat

A. asparagoides appears to be a rare species and is known from a small population of about 10 individual plants growing in dry fynbos near Wuppertal in the Cederberg (Fig. 4). Possibly additional plants have simply been overlooked, and that more populations will come to light (only a single plant was collected to serve as type material). The plants were found growing in disturbed ground along an erosion gulley in loamy sand. It seems likely that *A. asparagoides* and *A. fibrosa* are allopatric

sister species; the latter is known only from a few populations near Nieuwoudtville (Fig. 4).

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